

With the Author's Compliments

OUR PERSONAL EQUATIONS:

AN ADDRESS

DELIVERED BEFORE

THE ALUMNI ASSOCIATION OF JEFFERSON
MEDICAL COLLEGE,

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OUR PERSONAL EQUATIONS.

GENTLEMEN AND LADIES:

In preparing his thoughts for an occasion like this, a speaker who has had many predecessors will be lucky if he finds for his flail some straw left unbeaten by former threshers.

That repetition which in the class-room deserves the appellation "mother of learning," on the rostrum might be condemned with the forcible adjective applied by Othello to the iterations of Iago. The customary topics of medical orators—Medical Education, Expert Testimony, Sanitary Science, Professional Ethics—with the phrases staple in such discourses, have been worn quite threadbare.

The most fit for these halls, The Ideal Medical College, is one which were better left to some successor more sure of his own opinions, and more desirous of bringing the world into conformity with them. The old alumnus who has taken a turn through the hospital and the laboratories is no longer free to doubt that the process of evolution is carrying medical teaching through ascending phases. Perhaps, with a conviction in favor of a graded curriculum, he is disposed to find fault with the annual repetition which, like a circle, makes no progress. If so, then his own experience as a student may be appealed to in proof that there was a decided advance where it was needed, namely, in his own medical knowledge. His second course of lectures was to him not the same as his first; it presented to his larger intelligence wider reaches than he could at first take in.

The circle repeating itself, and so far as the student is concerned widening in each cycle by his mental growth, makes the spiral, the ideal course of philosophic teachers. As he looks about him he can see that the nursing mother moves with her Juno stride by sure paths, revealed to eyes that range under level brows. Step by step she has walked ahead of us, mending her pace as we quickened ours; never out of reach of good movers, yet always leading them. Shall we inveigh against the imperfections of our nurture who failed so often to hearken to the maternal voice. The faults most to be deplored were those in ourselves, that we did not use our opportunities better.

Then we daily sat down to a board of seven courses, and nibbled like dyspeptics at the generous fare for which we have since hungered.

Remembering the uniform perversity of mankind, it may fairly be questioned if the newly-adopted foster-brothers have done much better than we, notwithstanding the epicurean cooks who lately sharpened their dull appetites with savory sauces. There were great cooks in our day too, who could serve a lecture in a way to tempt an angel to learn medicine, however useless the art might be in the land without sickness.

Sitting under a broad porch which gave upon a lawn of that blue grass that makes fat cattle and glad harvests, I heard an old alumnus discourse of our *alma mater*. Said he: "They say that a man is thoroughly renewed every seven years. I want to go back to 'Old Jeff.' once for each renewal, in the hope that the new man will learn better the things new and old than did the former man what was taught in his time." He had been back once to take draughts from the maternal font, but his business and his babies had since anchored him fast in Kentucky, and he consoles himself with the dream that, with other Jeffersonian angels, in Paradise he may again hear Duglison tell about his experiments on Alexis St. Martin; Meigs dilate upon woman, and her glorious mission of motherhood; Gross lament in moving accents the lost art of phlebotomy; see Biddle wave a graceful salute before relating in rhythmic speech the opinions

held by Dioscorides concerning the concrete juice of the unripe capsule of the *Papaver somniferum*; and Pancoast go through the dextrous motions of operations for which that happy land will furnish no clinical material.

It was a glad reunion, as I sat with that foster-brother that June day fifteen years ago and looked out on his waving corn and the gold-spotted meadow. I brought him news of the *alma mater*, and set him raking together the embers of old fires, and helped him blow them into something of their ancient warmth. Would that this occasion were less formal; that all of us might sit as by a family hearth, and each recount in turn the familiar things that lose none of their charm by age. We might hear some new-born brother tell of things the gray-beard thought his own peculiar experience. I am sure that my counterpart has sat on these benches since I left them. More than one callow youth has come out of the New West to this city of traditions, ready to wonder at Independence Hall, and at the Franklin Library, founded by the "Junto" of immortal memory. More than one, as he took an early pilgrimage to the grave at Fifth and Arch streets, has felt that Benjamin Franklin, like St. Paul, had been "a citizen of no mean city." More than one has had a fresh sense of his own importance as the elder Gross indorsed his letter of introduction and consigned it to a pigeon-hole with other papers of weighty consideration. More than one — aye, thousands — with hearts touched by these small amenities from a great man to his insignificant students, have proved themselves bound to him with hooks of steel.

If I hold to my purpose, it is time to stop the flood of reminiscences that stream in. It were grateful to all of us to celebrate the worthies of our college days and beguile the hour with retrospective ramblings. But such an eloquent tribute to their memory has been given in this place by one who preceded me seven years ago, that the thought of rivalry in this field oppresses me, and I turn to another theme for my word-spinning. In the half hour for which I feel privileged to hold you by the button, there is opportunity to air some reflections about *The*

Personal Equations of medical inquirers. If I succeed in presenting familiar facts in a new grouping and in such a way as not to be disagreeable, then I shall be satisfied.

The importance of these considerations may not strike every one, for scientific inquiry often meets with the reception accorded by Confucius to the inquisitive boy. As Carlyle relates it, the boy asked Confucius, "How many stars are in the sky?" The sage replied "He minded the things near him." Then said the boy, "How many hairs are in your eyebrows?" Confucius answered, "He didn't know and did n't care."

About ninety years ago the Astronomer Royal of England regretfully announced that he had to part with his diligent and useful assistant, as he had lately acquired an inveterate habit of recording his observations half a second too late. The whirligig of time brought the assistant his revenge, as later astronomers put just as much reliance on his observations as on those of his principal. It was found that both were slightly wrong, both were liable to err, as are the most skillful observers. Indeed it is only when that various creature, man, is not a part of the machinery that we can put entire trust in the register.

These variations from the absolute truth in measuring minute divisions of time and space can be estimated by comparison with instruments of precision, and are usually found to be constant for the same person in the same class of observations. The habitual error, characteristic of a person, is called his *personal equation*, and is a correction to be applied to his record of all events of like nature. Time is an element, first in perceiving, next in willing, last in recording. These processes in different men go on with varying degrees of rapidity. As quick as thought is, there is time in it for some to fall behind others. Astronomers tell us that there are variations in researches that do not rank as precise which are more marked than those just referred to. It is probable that examples of *personal equation*, using the term in its widest sense, are to be found in every form of inquiry. As instances of it in observations that do not admit of mathematical measurement, we are told of the different pic-

tures drawn by different observers of nebulae and the corona of solar eclipse. It would be an easy problem for some ophthalmologist to determine if unsuspected and uncorrected astigmatism may not account for some of the variations, as Liebreich showed its effects in certain peculiarities of Turner's landscapes. While we may not hope to secure an exact valuation of the personal equation in such subtle forms as these, it is of importance to know when allowance should be made, and in what direction to apply efforts for the amelioration of the defect.

Turning from these distant objects of study, let us follow the example of the wise Confucius, and "mind the things that are near us." In the science we cultivate there are some occasions for micrometric data in physiological research. In every department of medicine it is highly important that observers should see, hear, understand, and report accurately, so that others may apprehend rightly the appearances of disease and the effects of remedies.

If it were not for the frequent gleams reflected on every hand from the spectacles of the young, showing that the enterprising oculist with his trial glasses has been abroad in the land, one might think that uncorrected myopia was responsible for some errors. Prof. Hermann Cohn states that about sixty per cent of the medical graduates at Breslau were short-sighted. It is not likely that medical science runs any risk from this quarter. Ordinary short-sightedness does not materially affect observations made at the bedside, even if the observer should be so exceptionally stupid as not to find out his defect during his medical studies, or so remiss as not to avail himself of the correction afforded by glasses. Besides the sense of form there is the wholly distinct sense of color, in which a considerable number are unconsciously lacking. For a hundred years Daltonism has been recognized as a physiological curiosity, but it is only a few years since its practical bearings have attracted attention of persons long familiar with the importance of the errors of vision for form.

Examination of something like a quarter of a million per-

sons, in different parts of the world, shows that about four per cent of the males in any community may be counted on as radically color blind and relatively unfit for occupations requiring the use of the color sense. Dr. Jeffries relates an instance of a color-blind boy at the Boston Institute of Technology, who failed in chemistry, which he had chosen as a profession, because without some normal-eyed person by his side he could not determine the color of precipitates.

Apart from this congenital and incurable fault, experts have detected a hitherto unsuspected amount of ignorance of colors and color names among males of all ages and all degrees of education. It shows itself among teachers of physics and even among those who have technical uses for the nicest color sense. Virchow, at the meeting of the Anthropological Society of July, 1878, urged the practical teaching of colors, as he had found that the majority of young men were incapable of selecting with certainty the finer shades of the most common colors. In his experience, "It was exceptional that a medical student could tell whether a red shaded into a black, blue, or brown, or whether a yellow shaded into gray, white, or green." He continues: "This was a lamentable defect of the eye very seldom dependent on color-blindness, but on ignorance of color and lack of practice."

It would not be a wholly fruitless labor if some one with a trained and sensitive ear were to take the pitch of certain sounds heard in thoracic auscultation, and then test a medical class by means of organ pipes to ascertain if these sounds do not sometimes pass the limits of hearing in those whose range is not of the highest. Dr. Wollaston remarked total insensibility in some persons to the sound of a small organ pipe, which in respect to loudness was far within the ordinary limits of hearing. There are individuals who have keen ears for the lower sounds who never hear the squeak of a bat, the cricket's note, or even the chirrup of a sparrow. Sir John Herschel states that while some persons not at all deaf can just hear a note four octaves above the middle E of the piano, which is below the

chirrup of a sparrow, others have a distinct perception of sounds two octaves higher.

It is a reasonable conjecture that some of us present, who have normal hearing as respects the middle and lower octaves, are defective in the highest without knowing it, and thus fail to hear chinking or hissing sounds like the percussion note known as the cracked-pot sound and some sibilant râles, fine crepitation and creaking friction sounds to which others are acutely sensitive. It will be understood that this personal equation bears no relation to what is called a "musical ear," which is properly defined as a faculty of distinguishing discords. Like color-blindness, it has probably an anatomical basis, is congenital and not susceptible of improvement. There is, however, in those untrained in music a relative inability to discriminate in the pitch of sounds of percussion and auscultation like the before mentioned ignorance of color shading. In his essay on variations of pitch of percussion and auscultatory sounds, Prof. Flint observes that "to the musical ear, more especially if skilled in discriminating musical tones, a disparity in pitch is more quickly as well as more clearly distinguished." When the beginner finds a difficulty in perceiving a difference in sounds apparent to the practical diagnostician, Prof. Flint has made it manifest by requesting him to compare the two sounds as if they were musical notes, with reference to pitch. If he has had musical cultivation, the disparity is quickly perceived. Such a preliminary training has been found of material service in acquiring expertness in auscultation and percussion.

In an article in the Fortnightly Review, based upon a large amount of testimony and controlled by the methods in use by statisticians, Mr. Francis Galton states that he finds great differences in the power of forming pictures of objects in the mind's eye. This power of sight-memory is a reversal of the order of events in the original perception. An excitement of the brain propagates itself outward to the visual center back of the retina, producing pictorial irritations more or less true or vivid, according to the vigor of the outward impulse.

In some this faculty is habitually weak, and the propagation will take place only under such peculiar states as dreams, delirium, great excitement, or stimulation by drugs. Others reproduce past scenes with a distinctness little short of actual sight. It was found that the medium quality of mental imagery, though fairly vivid, was incomplete. Only one in sixteen had it in the degree to be desired.

I venture the opinion that this faculty of mental imagery is the basis of that knowledge of topographic anatomy of so great importance to the operator especially, but valuable to the doctor at every turn. Upon it, to a great extent, depends the student's ability to state the relations of nerve, artery, and vein, without resorting to the mnemonic arrangements of N., A., and V., that quiz-masters cram them with. This natural gift, when joined to certain other qualities—self-reliance and mechanical tact—is the making of a surgeon. I have known a man of fine mind, well equipped in these last-named respects, and who had good opportunities for advancement, fail as an operator of the first rank because he lacked this power of visual memory. It is not rare for the surgeon, on the eve of an operation, to refresh the pictures memory drew in fading colors by resort overnight to the anatomical atlas. This serves the purpose in many cases, but it is not the best way of knowing the anatomy of a surgical region.

According to Napoleon, the rarest and most valuable trait in a soldier is "two-o'clock-in-the-morning courage." So, I would say, the ideal anatomist is one who, awakened at midnight for an emergency, has his knowledge at his fingers' ends.

It is the opinion of Galton that in twelve out of sixteen this topographic memory may be developed to a useful degree by education. He lays especial stress upon the testimony of the Director of the National School of Design in Paris, who, beginning with the simplest figures, trained his pupils to study models with the view of drawing them from memory. After four months' practice they had no difficulty in summoning images at will, holding them steadily in the mind, and drawing them

with accuracy. He relates the experience of an engineer, who, after a few weeks of systematic practice, found, to his delight, that he had become an adept at color-memory, which, up to that time, had been an undeveloped faculty. Mechanics, engineers, and architects, who practice the drawing of an intended structure in all its dimensions, usually have mental vision of remarkable clearness and precision. This faculty must have been possessed by the late Prof. Wallace in an unusual degree. By off-hand modeling with colored clays he would give plastic expression to his picture-memory of anatomical details. Doubtless there are many here who remember how, with a few deft touches, he would make tumors rise before the class, or would inflict on counterfeit pelvic viscera all sorts of pathological changes.

In the presence of older and better teachers than myself, it is with diffidence that I hazard the suggestion that a course of practical anatomy, in which the student would be required to draw in outline from memory, or roughly work up in clay, the forms and relations of parts laid bare in his dissections the day before, would be a valuable addition to the present means of instruction.

Conning of text-books on anatomy gives verbal memory; but, according to Galton, bookish methods tend to repress the pictorial gift of nature. It is possible to starve it by disuse, and again to feed it by judicious methods of education. There are many present, fresh from the quiz-room, who can give, by an effort of verbal memory, the layers of structure encountered in making the dissection for inguinal hernia, who can not make a sharp picture of them in their minds, much less an outline drawing of the relations of the inguinal rings and other parts concerned. If each of ten doctors, taken at random, were to describe faithfully the mental vision he would have of the path of a bullet shot through a given spot in the trunk of a subject, I warrant there would be evidence of personal equation as well as of imperfect modes of instruction. It may be objected that the proposed improvement in the conventional method requires

that the student should have an unusual talent for drawing. To make an outline indicating the form and relative position of parts does not call for any artistic power worth the name. Experienced teachers assert that any one not blind, lame in the hand, or imbecile, can acquire at least this degree of proficiency. It is within the reach of any one who can learn the art of penmanship. In educational conventions one hears a good deal said about the *New Education*. Its advocates claim for it that it is the cream of traditional methods worked into a system. It is wholly different from the Chinese plan of committing to memory endless pages from Confucius, and thus loading the mind with good-for-nothing lore. Its primary aim is avowed to be to teach the pupil to see, hear, and understand correctly, in order that he may take up the study and work of after-life as free from defects of his five senses as culture can make him. Practice in drawing is a salient feature. It has been found that along with the training of the hand, this tends to develop quickness and accuracy of perception, and a fidelity in objective memory that is surprising to those educated under the old routine. Courses in music have been for years an element in the public school curriculum in many parts of our country, with results equally gratifying. While it has not been expected that any one can be made to hear notes beyond his normal scale, improvement in the power to discriminate the pitch of sounds has been unequivocal. You and I may consider ourselves too old to go into training of this sort; but in this we differ from a busy practitioner over sixty years of age, a neighbor of mine, who, in a recent affliction, found solace and substantial self-culture in taking up a course of drawing. We can at least see to it that our own children and the students we send up to *alma mater* in the twentieth century have not only a good academic education, but, better than that, have been taught with especial reference to seeing, hearing, and understanding correctly whatsoever things come up in the life-work before them.

It is a popular impression that when one brings to the aid of the lens in his eye other lenses outside, the chances of fallacy

are thereby removed. That this is erroneous all working microscopists are well aware. There is a distinguished histologist in New York who teaches and demonstrates to the apparent satisfaction of his pupils that there is a reticulum in the blood corpuscle which is an exhibition of the network present generally in protoplasmic structures. On the other hand, the great majority of our histologists and the most skilled manipulators of high power objectives assert their inability to see the network spoken of. What they see in his demonstration is, according to them, the usual appearance presented by granular bodies when viewed slightly out of focus. If the drawings made by him represent the cell as he sees it, there is a decided difference between his microscopic vision and that of most experienced observers. This would be an instance of personal equation on the part of some one. As to the party to whose observations a factor of error must be applied, photography alone offers a final judgment. By this means the late Dr. Woodward succeeded in convincing foreign microscopists that the resolution of Nobert's 19th band was not simply a matter of faith but one of sight.

It may turn out that the difference is not one of sight but one of interpretation. The liability to misinterpret besets the path of the scientific observer in every field.

When Carlyle said that "a man sees what he brings with him the power to see," he meant that through the optical apparatus of vision there was an eye of the intellect looking, perceiving, and interpreting. This recipient eye back in the optic lobes or perhaps in the visual center of the cortex, colors every object of sensation whose image passes into it.

The mind is conscious of that object, not as it entered but as it has been refracted by the prismatic medium of personality through which it was transmitted. A great obstacle in the way of seeing things plainly as they are, is a prepossession in favor of a certain view of them. Pride of opinion may thus create a personal equation; so may a love of sensation or a rage for novelty; so may the fanaticism of hypothesis. To a pet

hypothesis has been ascribed the quality of assimilating all observations to itself. Standing erect among the facts it is a convenient stem around which the investigator twines his pliant impressions, stem and vine, each helping to hold the other up. It is not my intention to say aught in dispraise of theory as such. It has been well said that nothing is so helpful to the investigator as a good theory. Like wine it is a good servant but a bad master. Used rightly it is a wholesome stimulant, but some thirsty souls are so constituted that they can not take it in moderation. If they once take a sip at a theory they tope with it, and under its influence see things double and lose their mental equipoise, until time and the jostling of critics sobers them off.

It has been recently announced that the new American Society for Psychical Research disclaims that its object is the study of supernatural phenomena. The ground they propose to tread is tolerably safe so long as they confine their inquiry to those mental states in which certain persons, called "thought readers," seem to have the faculty of knowing some of the ideas of others. If we may judge by the career of the English society of that name, there is a tendency in those who concern themselves about "thought transference" to step over into the twilight land of clairvoyance where the marsh meteors soon lead them into a bog. The large proportion of physicians in the American Society is an assurance that it will not be allowed to degenerate, as did the English one, into a medium for giving consequence and permanence to all the ghost-stories treasured in bereaved families as assuring glimpses of the presence of their dead.

Doubtless "there are more things in heaven and earth than are dreamt of in our philosophy," but when an observer's feelings are strongly interested they so influence his judgment as to what he sees of these undreamt of things, as to make him a very unreliable witness. It would be difficult to exaggerate the tendency to self-deception in examining the phenomena of spiritualism when the investigator is possessed with a long-

ing for evidence of the spiritual existence of some dead friend or relation.

Only those rare beings who can get outside of themselves, who are able to put aside the craving for communication with the dear travelers in that undiscovered country, only these are qualified to estimate with judicial fairness the extravagant pretensions of clairvoyance, spiritualism and mesmerism. These are mentioned together because opinions, like other furniture, "go in sets;" and it is in these that the dominant idea referred to becomes a personal equation of notable size. It is a matter for medical men to consider, inasmuch as it is vaunted that those who believe in and resort to these occult powers, have great advantages in diagnosing and curing disease. It is alleged that some persons possess by nature a faculty of seeing through opaque objects; they are clairvoyant, see by transcendent vision things out of the common range. A patient of mine dropped in with a friend at the residence of one of these "psychometric mediums," who nearly frightened her out of her wits by gravely telling her that he could see that she suffered from headache and pain in the side, due plainly to the fact that her liver was bound back to her diaphragm. She thought it witchcraft that he should without examination divine these things, but was somewhat reassured when told by me that as for the headache and sideache, they might be counted on as symptoms in almost every woman that entered a doctor's office, and that she would be in a bad way if her liver was not so anchored. I have never seen or heard on good authority of one of these gifted beings that had the powers of diagnosis possessed by a new medical graduate, and yet belief in the verity of their claims has grown by waves of popular excitement until it includes people of undoubted intelligence. At times the epidemic has seized men of science and even educated physicians, though the vast majority of the well instructed look on clairvoyance as unprofitable in speculation and quackery in practice.

In the library on Fifth Street, founded by Franklin and his "Junto," is a copy of a report on Animal Magnetism, made by

Dr. Franklin and others to the French Academy just one hundred years ago. Like all documents that Franklin had a hand in making, it is thorough and perspicuous. The experiments by which they were convinced of the baselessness of Mesmer's claims are models of ingenuity. They show the master mind of that wonderful Philadelphian, who had a seeing eye of the highest power. Did you ever think how much his vision resembled the spectacles he invented. Half the glass was for near and half for distant objects. Nothing that interested him, either remote or at hand, was he content to view dimly. Upon them all, smoking chimneys and thunderbolts, he directed his clear and true sight. The pretensions of Mesmer alike with the pretentions of tyrants he saw through and exhibited to the gaze of all. At the same time in his report he concedes a certain value to the phenomena exhibited by those said to be mesmerized, they furnish "important evidence of the power of the imagination."

Again and again did the French Academy respond to the popular clamor for investigation, until it dismissed the subject of clairvoyance in a report published in 1837, by stating that the facts furnished have nothing in common with physiology or therapeutics. A standing offer was made by Burdin, and since repeated by others, of large sums of money to any one who should produce a clairvoyant able to read through an opaque medium. Although the experiment has been variously altered at the instance of those making the trial, no one has yet succeeded in winning the prize. The attempts have, however, resulted in the detection of the means by which the credulous have at times been imposed on. When the neurologists of the Society for Psychical Research shall discover an individual who can satisfy this reasonable demand, it will be conceded that in this direction their labors have not been in vain. Experience forbids us to hope than such a one exists.

For fifty years, those claiming to see blindfold what is not revealed to the eye, have not brought to human knowledge a single new fact concerning the inner workings of things. What

discoveries in physiology and pathology would flow from the use of any instrument that would compensate, even in a small degree, for the limitations of sight and hearing! So often baffled and led astray by the inadequacy of the eye and ear, mankind would then have to make allowance for a personal equation in doctors who attempted to solve medical enigmas without its aid.

Alas! for the beautiful dream, no clairvoyants have ever penetrated this veil further than common people; indeed they have left the glorious privilege of adding to the sum of scientific knowledge entirely to folk of five senses only, while they grope on in a limbo where honest minds seem forever doomed to struggle with fraud, credulity, and superstition.

If the Society for ^{Scientific} ~~Physical~~ Research shall make a report differing in important particulars from the settled conviction of most men of science, again, as often before, will be raised the charge of "bias and credulity," and again will be heard the retort of "scientific prejudice and intolerance."

Between these two extremes it will be hard to find and hold the diagonal line. In such a controversy we shall be much in want of a mental dynamometer, which shall give us some approximation to the personal equation of mental strength in the disputants.

All the traditional methods of gauging the mind depend too much on tests of memory, quite a subordinate faculty. It does not seem at all likely that man shall ever invent any adequate plummet to sound these "abysmal deeps of personality." Nor can he ever be satisfied to turn away from this question as Confucius did from that concerning the number of hairs in the eyebrow, and say because he does not know how much allowance to make for personality, therefore, he will not care for it as a factor in medical investigation.

Of one thing we may be sure, that, in cultivating our five senses, much may be done to lower all their personal equations. While thus engaged there can be no doubt that we walk on solid ground and in the middle of the road. Instead of forming mag-

netic circles in the dark, waiting in a pliant hour for spiritual insight to develop to the point of receiving impressions concerning things which shun the light of day, the sure way will be by incessant practice to sharpen the natural powers of observation so as to acquire that professional sagacity which notes myriads of fine differences and resemblances that escape the scrutiny of the untrained intellect. May ours be that clear-sighted skepticism that would discount every personal equation in ourselves and others; that would turn the white light of criticism upon every reputed revelation lest some fallacy steal in under the garb of truth. To free itself from bias and achieve perfect uprightness, the scientific mind must be imbued with a religion in which ^{silent} slight adoration shall be offered to those natural laws that have been called the thoughts of God; in which the best faith shall be honest doubt, the worst unbelief shall be to question the permanence and beneficence of truth, and in which a grievous sin shall be imputed to him who is indifferent to its pursuit. Should it ever want a litany, what better invocation than:

"Give me no light, great Heaven, but such as turns
To energy of human fellowship;
No powers, save the growing heritage
That makes completer manhood."

